

*Conservation Assessment
for
Fairy Bells (*Disporum hookeri*)*



USDA Forest Service, Eastern Region
September, 2000

Prepared by:
Nancy Larson, Partnership Coordinator
Ottawa National Forest



This document is undergoing peer review, comments welcome

This Conservation Assessment was prepared to compile the published and unpublished information on the subject taxon or community; or this document was prepared by another organization and provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject taxon, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

Table of Contents

EXECUTIVE SUMMARY	4
INTRODUCTION/OBJECTIVES	4
NOMENCLATURE AND TAXONOMY	5
DESCRIPTION OF SPECIES	5
LIFE HISTORY	6
HABITAT	6
DISTRIBUTION, ABUNDANCE AND MONITORING	8
POPULATION BIOLOGY AND VIABILITY	10
POTENTIAL THREATS AND MONITORING	11
RESEARCH AND MONITORING	12
REFERENCES	12

EXECUTIVE SUMMARY

This conservation assessment provides a review of known information regarding the distribution, habitat, ecology and population biology of fairy bells (*Disporum hookeri*) in the western Upper Peninsula of Michigan. Even though the plant is common in the Pacific Northwest of United States, and is ranked as “uncommon but not rare globally” to “common, widespread and abundant globally” by The Nature Conservancy, it is an endangered plant in Michigan. It is a rare disjunct, occurring only in the western Upper Peninsula. The reasons for its rarity are not well understood. In this region, it is found in mesic, mature forests of sugar maple (*Acer saccharum*) and eastern hemlock (*Tsuga canadensis*).

Several primary threats to the survival of *Disporum hookeri* in the western Upper Peninsula of Michigan include competition from other species, loss of protective snowpack during cold winters, shorter growing season than that to which the species is accustomed, deer herbivory, and change in canopy closure or alteration of habitat. Other threats may include competition by invasive non-native plants and loss of insect pollinators.

The opportunities for research and/or monitoring of *Disporum hookeri* include gaining an understanding of general life history, habitat requirements, and threats to viability in this region. Specific parameters to help understand the ecology and distribution of *Disporum hookeri* may include the following: length of frost-free season, amount of snow cover, average date of snow melt and spring time maximum daily temperature. Research and/or monitoring known populations as well as continued field searches for *Disporum hookeri* are needed to answer some of these questions. At a minimum, monitoring of known sites will be required to obtain baseline information needed for management of the species.

INTRODUCTION/OBJECTIVES

One of the conservation practices of the USDA Forest Service is designation of Regional Forester Sensitive Species. The Eastern Region (R9) of the Forest Service updated its Sensitive Species list on February 29, 2000. Part of that process included identification of priority species for conservation assessments and strategies. *Disporum hookeri* (fairy bells) was one of those priorities.

The objectives of this document are to:

- Provide an overview of the current scientific knowledge
- Provide a summary of the distribution and status rangewide and within the Eastern Region of the Forest Service
- Provide the available background information needed to prepare a subsequent conservation strategy.

The National Forest Management Act and U. S. Forest Service policy require that Forest Service lands be managed to maintain viable populations of all native plant and animal species. A viable population is one that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its range within a given planning area (FSM 2670.5.22). In addition to those species listed as endangered or threatened under the Endangered Species Act, or Species of Concern by U. S. Fish and Wildlife Service, the Forest Service lists species that are sensitive within each region (Regional Forester Sensitive).

Disporum hookeri is listed as Regional Forester Sensitive in Region 9, the Eastern Region of the U.S. Forest Service (see definition in Status section). The objectives of management for such species are to ensure their continued viability throughout their range on National Forest lands, and to ensure that they do not become threatened or endangered because of Forest Service actions (FSM 2670.22).

This conservation assessment is an administrative study only and does not include management direction or management commitment.

NOMENCLATURE AND TAXONOMY

Scientific name: *Disporum hookeri* (Torrey) Nicholson
Disporum hookeri var. *oreganum* (S. Watson) Q. Jones

Common names: Fairy bells, drops of gold, Hooker's fairybells, Oregon's fairybells

Family: Liliaceae

Synonymy: *Prosartes hookeri* Torrey
Disporum oregonum (S. Watson) W. Mill

DESCRIPTION OF SPECIES

Disporum hookeri is a perennial herb up to approximately 2 feet tall. The stem of fairy bells is upright and single from an underground rhizome, then usually branches in the upper portion in a forked manner. The finely hairy (at least when young), straw-colored stem terminates in 1-3 (usually 2) creamy-white, narrow, bell-shaped flowers hanging from the tip of the branch (Pojar and Mackinnon 1994). Flowers have six petal-like segments, 3/8 – 5/8" long, and the styles are usually hairy (Spellenberg 1979). The fruit is 4-6 egg-shaped, drooping berries that turn red in late summer to fall. The leaves are sessile, slightly clasping and paper textured with a dull upper surface that is usually hairy. The leaves are prominently veined with the parallel veins conspicuous and netlike veins less pronounced. Leaf margins are fringed with short, spreading hairs (Chadde 1999).

Similar species to *Disporum hookeri*, and frequently confused with it, are *Streptopus roseus* (rosy twisted-stalk), *S. amplexifolius* (clasping-leaved twisted stalk), *Smilacina racemosa* (false solomon-seal), and *Polygonatum pubescens* (solomon-seal).

LIFE HISTORY

Little is documented about the life history of *Disporum hookeri*. In the Pacific Northwest, this perennial herb along with its cousin, *Disporum trachycarpa*, flowers May – July (Spellenberg 1979). Plyons (1991) notes that pairs of drooping flowers can be found on ends of branches during May and June. In the western Upper Peninsula of Michigan, *Disporum hookeri* blossoms in spring before full leaf-out of overstory trees. The plants are fairly well shaded for the rest of the growing season (Chadde 1999). Fairy bells flowers extremely early considering the late springs of the Lake Superior snowbelt. Mladenoff (1990) discovered a flowering individual on May 6, and immature fruits by June. At several Ottawa National Forest sites, plants were past flowering and had immature fruits by mid-July.

Little is known about the seed dispersal of fairybells in the western Upper Peninsula. Judziewicz et al. (1997) assume “birds are responsible”, while Mladenoff (1990) states the fruits are “presumably vertebrate dispersed”. Solheim and Judziewicz (1984) suggest the possibility that seeds of fairybells are dispersed via boots of foresters who fight western fires and then return to the Midwest. Mladenoff (1990) notes that since many of the sites where *Disporum hookeri* is found are in a “wilderness preserve”, then the seed dispersal is more likely to be on the boots of “traveling campers and hikers”.

HABITAT

The habitat of *Disporum hookeri* in the Pacific Northwest is wooded areas near streams, moist woods, and specifically moist coniferous or mixed forest at low elevations (Spellenberg 1979; Lyons 1991; Pojar and Mackinnon 1994). However, Mladenoff (1990) notes it occurs in a variety of habitats from mesic to moist uplands.

In the western Upper Peninsula of Michigan, *Disporum hookeri* is found in rich deciduous forest with sugar maple (*Acer saccharum*) and eastern hemlock (*Tsuga canadensis*) predominating (Chadde 1999).

Judziewicz et al. (1997) and Mladenoff (1990) observe that *Disporum hookeri* occurs in mesic old-growth forests. Sites where *Disporum hookeri* has been found are “far removed from existing roads or trails”, according to Mladenoff 1990. However, sites have been found on the Ottawa National Forest in close proximity to roads and hiking trails.

The western Upper Peninsula (Ottawa National Forest and Porcupine Mountains State Park) habitats are summarized below:

Site No.	Forest Type	Canopy Cover (%)	Aspect	Microhabitat	Soils	Other
1	Mature sugar maple-hemlock	NA*	NA	NA	Well drained, clayey loam	Plant browsed
2	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA
4	NA	NA	NA	NA	NA	NA
5	Sugar maple-basswood-red maple	95	NA	Moist swales near rock wall	NA	NA
6	Sugar maple-basswood	50	NA	Shallow swale associated with intermittent small drainage	Moist, dark, rocky	Site within timber harvest area, population buffered from harvest activities
7	Sugar maple-yellow birch	70	E	Sloping to small swale	Moist, rocky	NA
8	Sugar maple	85	N	Sloping; old blowdowns	NA	NA
9	Sugar maple-hemlock-yellow birch	70	S	Adjacent to stream; sloping; site with swales and rocky ravines	Moist, black, rocky	NA
10	Cedar-hemlock-fir	NA	N	Near small perennial stream	Moist clay	<i>Equisetum scirpoides</i> understory (atypical)
11	Ironwood-basswood	85	N	Near intermittent rocky drainage, sloping	Rocky, well-drained	NA
12	Sugar maple-yellow birch-hemlock-oak	90	Various	Near intermittent and permanent streams, sloping	Rocky	Site within timber harvest area, population buffered from harvest activities

Typical associates at the above sites include the following:

Herbs: *Adenocaulon bicolor* (trail plant), *Allium tricoccum* (wild leek), *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Athyrium filix-femina* (lady fern), *Caulophyllum thalictroides* (blue cohosh), *Clintonia borealis* (blue-bead lily), *Dentaria diphylla* (two-leaved toothwort), *Dryopteris carthusiana* (spinulose woodfern), *Dryopteris intermedia* (intermediate woodfern), *Gymnocarpium dryopteris* (oak fern), *Maianthemum canadense* (Canada mayflower), *Osmorhiza claytonii* (sweet cicely), *Polygonatum pubescens* (solomon-seal), *Smilacina racemosa* (false solomon-seal), *Streptopus roseus* (rosy twisted-stalk), *Trillium grandiflorum* (large-flowered trillium), *Uvularia sessilifolia* (merrybells), *Viola* spp. (violet).

Shrubs: *Corylus cornuta* (hazel), *Dirca palustris* (leatherwood), *Lonicera canadensis* (fly honeysuckle), *Rubus parviflorus* (thimbleberry), *Sambucus canadensis* (elderberry); and seedlings and saplings of sugar maple, yellow birch, and ironwood.

The herb layer cover varies from 20 to 95% at the Ottawa National Forest sites, and the shrub layer cover from 5 to 80%.

DISTRIBUTION, ABUNDANCE AND MONITORING

Disporum hookeri is common in the western United States. The contiguous range of *Disporum hookeri* includes central Oregon's Coast Range and the Cascades extending north through Washington and British Columbia, and in the Rocky Mountains of southern British Columbia extending to northern Idaho, northwestern Montana and south to the Blue Mountains of northeastern Oregon (Mladenoff 1990). This major range of fairybells surrounds yet avoids the dry Columbia River Basin of eastern Washington and Oregon.

In Michigan, it is a Pacific Northwest disjunct only known east of the Rockies in the Ontonagon County area, specifically the Porcupine Mountains and Bergland (Trap) Hills area (Marquis & Voss 1981; Mladenoff 1990; Judziewicz et al. 1997; Trull 2000 pers. comm.). No known populations exist between the western Upper Peninsula and the Rocky Mountains. Figure 1 illustrates the western Upper Peninsula, Ontonagon County range. Approximately twelve locations are known in the western Upper Peninsula, with eight of them on the Ottawa National Forest (Trull 2000 pers. comm.).

There are four documented element occurrences for *Disporum hookeri* in the Porcupine Mountains State Park, north of and adjacent to the Ottawa National Forest. On the Forest, there are eight element occurrences, all in Ontonagon County, on the Bergland and Ontonagon Ranger Districts. These occurrences are in the Trap Hills and the moraines east of there. Populations at these sites are summarized below:

Site No.	Location	Population Size
1	Porcupine Mountains State Park	3
2	Porcupine Mountains State Park	Not available
3	Porcupine Mountains State Park	NA
4	Porcupine Mountains State Park	NA
5	Bergland Ranger District	50+
6	Bergland Ranger District	300+
7	Bergland Ranger District	2
8	Bergland Ranger District	1
9	Ontonagon Ranger District	16
10	Ontonagon Ranger District	1
11	Ontonagon Ranger District	2
12	Ontonagon Ranger District	~1400

Since the range of *Disporum hookeri* clearly shows a distinct discontinuity in its distribution between the west and the Great Lakes region, it is considered a “western disjunct”. Marquis and Voss (1981) discuss several theories for disjunction that involve responses to past glacial activity in the region. Fairybells either migrated to habitat along the receding ice margin from its western origin, or a reinvasion of the habitats occurred following what was once a continuous, continental distribution. Mladenoff (1990) notes that *Disporum hookeri* fits these theories poorly based on it being found in mature mesic forests in the Pacific Northwest and in Michigan, and the few fruits found to date in this region.

Heritage Status



Figure 1: Distribution of Fairy bells in the Upper Peninsula of Michigan

Currently, the official status of *Disporum hookeri* with respect to Global, Federal and State conservation status (Association for Biodiversity Information 2000) as well as agency status given by rank and rank definition is:

U.S. Fish and Wildlife Service: none

U.S. Forest Service: Region 9 Sensitive

The Regional Forester has identified it as a species for which viability is a concern in the western Upper Peninsula of Michigan

as evidenced by: a) significant current or predicted downward trends in population numbers or density, and or b) significant current or predicted downward trends in habitat capability that would reduce its existing distribution (FSM 2670.5.19)]. *Disporum hookeri* is not known to occur outside Ontonagon County, Michigan, in Region 9, the Eastern Region.

Global Conservation Status Rank: G4G5 - *Disporum hookeri* (Torrey) Nicholson
G4G5T? - *Disporum hookeri* var. *oreganum*
(S. Watson) Q. Jones

G4: Uncommon but not rare globally (although it may be rare in parts of its range, particularly on the periphery), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. Typically more than 100 occurrences and more than 10,000 individuals.

G5: Common, widespread, and abundant globally (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

T?: Inexact numeric rank for status of infraspecific taxa (subspecies or varieties).

National Conservation Status Rank: United States: N?

N?: Unranked – National rank not yet assessed.(31 July 1993)

States: Michigan – S1 Endangered- *Disporum hookeri* (Torr.) Nichols
Michigan – SR - *Disporum hookeri* var. *oreganum* (S. Wats) Q. Jones

S1 Endangered: Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals (<1,000).

SR: Element reported in the state but without basis for either accepting or rejecting the report, or the report not yet reviewed locally.

POPULATION BIOLOGY AND VIABILITY

Fruiting is uncommon in the western Upper Peninsula sites; indeed, not all plants flower yearly. This restricts propagation and colonization ability of the species. The species does appear to propagate vegetatively at some of the known sites. Moreover, other members of the genus *Disporum* (*D. lanuginosum*, *D. maculatum*) are listed as candidates for native plant gardening, with propagation suggested by seed or division of the rootstock (Jones and Foote 1990). (The suggested habitat for cultivation is moist, shaded woods.)

As mentioned above, little is known about seed dispersal mechanisms, germination requirements or success, or distance of dispersal. Similarly, little is known about pollination needs or effective distances between populations to maintain genetic diversity.

Several of the known sites have less than ten plants and cannot be assumed to be viable long-term, given deer herbivory, climate factors, and environmental stochasticity. It is likely there are other, as yet undiscovered, sites on the Ottawa National Forest and adjacent lands, which can contribute to the long-term viability of this taxon.

POTENTIAL THREATS AND MONITORING

Threats

Several primary threats exist to the survival of *Disporum hookeri* in the western Upper Peninsula of Michigan. These include competition from other species; loss of protective snowpack during cold winters; shorter growing season than that to which the species is accustomed; deer herbivory; and change in canopy closure or alteration of habitat. Mladenoff (1990) notes that while *Disporum hookeri* has been present for sometime in the western Upper Peninsula, it is not an effective competitor. Competition can eliminate present populations or remove options for future colonization. Loss of protective snowpack too early in the season can also eliminate plants and reduce opportunities for additional colonization. The prolonged snowcover of the Lake Superior snowbelt protects the below-ground parts of the plants from the colder winter temperatures than what the plants are accustomed in the maritime-influenced Pacific Northwest. Conversely, the prolonged snow cover and the shorter growing season in the Lake Superior region result in infrequent years when fruits can become mature, which results in slow-to-spread and sparse populations. It is not certain to what degree the browsing of white-tailed deer (*Odocoileus virginianus*) impacts fairy bells. There is some impact from deer herbivory as revealed by “a portion of browsed individual” that was collected in September 1988 by Mladenoff (1990). A major reduction in overstory canopy closure or alteration of habitat due to changes in microclimate conditions are potential threats to the species as well (Trull 2000 pers. comm.). Changes in canopy closure can occur with windfall or with harvesting of adjacent trees.

The threat of competition by invasive non-native plants is not well understood. Loss of insect pollinators from pesticide use and general habitat decline may also be a threat (Trull 2000 pers. comm.). Collection of the ripened berries of this plant may also be a threat: in the Pacific Northwest, Native American tribes collect the berries, which are poisonous (Johnson 2000; Pojar & Mackinnon 1994). Since the plants are so uncommon in Michigan, it is unlikely that berry collecting is occurring.

Long-term viability of this species may be dependent upon maintaining habitat on public lands. While private landowners may be sympathetic to sensitive species, they are under no obligation to protect those not listed by the US Fish and Wildlife Service.

Opportunity exists, therefore, to create and maintain havens for rare species within federal and state land.

RESEARCH AND MONITORING

General life history information about this plant is sparse at best. In addition, habitat requirements and ecology in Michigan are not well understood (Mladenoff 1990). Specific parameters that Judziewicz et al. (1997) believe are critical to understanding the distribution of *Disporum hookeri* include length of frost-free season, amount of snow cover, average date of snow melt, and spring maximum daily temperature. Tolerance to disturbance such as canopy opening, effects of drought, and effects of deer herbivory are other topics needing research.

Monitoring the known populations as well as continued field searches for additional *Disporum hookeri* sites are needed to answer management questions and to obtain baseline information.

REFERENCES

- Association for Biodiversity Information. 2000. Natureserve. <http://www.natureserve.org>, Natural Heritage Central Databases. The Association for Biodiversity Information, Arlington, VA. (August 18, 2000).
- Chadde, Steve. 1999. A Forester's Field Guide to Endangered and Threatened Plants of Michigan's Upper Peninsula. PocketFlora Press, Calumet, MI. p.59.
- Johnson, Tim. 2000. <http://squid2.laughingsquid.net/hosts/herbweb.com/herbA8985.htm> (August 15, 2000).
- Jones, S.B. Jr. and L.E. Foote. 1990. Gardening with Native Wild Flowers. Timber Press, Portland, OR. pp. 61-62.
- Judziewicz, E. J., F.H. Utech, and W. Mackinnon. 1997. *Prosartes (Disporum) trachycarpa* (Lilaceae) in Isle Royale National Park: New to Michigan and Eastern United States. The Michigan Botanist 36: 63-72.
- Lyons, C.P. 1991. Trees, Shrubs and Flowers to know in British Columbia. Fitzhenry and Whitesides Limited, Richmond Hill, Ontario. p. 110.
- Mladenoff, D.J. 1990. A Pacific Northwest disjunct, *Disporum hookeri*, in Upper Michigan. The Michigan Botanist 29:97-102.
- Pojar, Jim and Andy MacKinnon. 1994. Plants of the Pacific Northwest Coast, Washington, Oregon, British Columbia and Alaska. Lone Pine Publishing, Remond, Washington. p. 102.

Solheim, S.L. & E. J. Judziewicz. 1984. Four noteworthy Wisconsin Plants. *Phytologia* 54:490-492.

Spellenberg, Richard. 1979. *The Audubon Society Field Guide to North American Wildflowers, Western Region*. Alfred A. Knopf, Inc., New York. p. 578.

The Nature Conservancy. Date unknown. Conservation Status Rank. pp. 1-8.

Trull, Susan. 2000. USDA Forest Service, Ottawa National Forest Botanist - personal communication with Nancy S. Larson, U.S. Forest Service.